NATIONAL MUSEUM OF THE UNITED STATES AIR FORCE®

A BIRD'S EYE VIEW / REMOTE SENSING-Part 2

Students will learn what remote sensing is and how it was developed, from the early years of 'pigeon photography' to the latest in satellite imagery. They will also develop an awareness of how things are interpreted within the realm of aerial photography!

LESSON PLAN — Part 2

Learning Objectives
The students will

- Learn about the development of remote sensing with respect to the five senses, focusing on sight
- Learn how to change their thought processes about how objects look from far above (not very easily done)
- Learn how to sketch familiar objects—not how they look from the typical 'side/personal view,' but from a perspective which is high above the object in question
- Understand how and why we changed our mindset from the normal vision of the world (eye level) to that of an aircraft flying in the sky (there are many advantages)
- Develop an understanding of how to interpret photographs taken from birds, kites, rockets, hot air balloons, aircraft, satellites and spacecraft—and how to interpret textures, colors, geometric shapes, shading and shadows

Introduction/Background- See Part 1 for details

- Ask the students to name all of our five senses, and write them on the board. Tell them that several of the senses can be enhanced electronically (such as hand-held 'dishes' used to amplify sound, and thus the sense of hearing) but announce that you are going to focus on sight for the purposes of these lesson plans!
- Tell the class that these days, when we want to take a picture from above (aerial photography) we use regular airplanes, 'spy' planes, helicopters and satellites which orbit the Earth. But HOW did people take aerial photographs many years ago—let's say over 100 years ago ('Bird's Eye View' PowerPoint is needed here).
- Show the students the animated drawing of Amelia the Pigeon with a camera around her neck (found on page 3: Teacher Addendum). Tell them that this bird with a camera is the silliest thing you've ever seen, and most of your students will agree. Then ponder a bit and say—or is it? Show the second slide in the 'Bird's Eye View' PowerPoint which depicts several pigeons with actual cameras strapped to them. Tell the class that this was one of the first methods of remote sensing, and show the next slide of an actual photograph taken by a pigeon (a European castle is shown and the forward-moving wing tips of the bird are on the edges of the picture)! Tell the students that the cameras were activated by timing mechanisms while the birds flew!

Grade Level: 2—4

National Science Education Standards:
Science as Inquiry, Science and Technology and History and Nature of Science

National Standards for History:
Chronological Thinking and Historical Comprehension

National Standards for Mathematics:
Geometry, Connections and Communication

National Standards for Arts Education/Visual Arts:
Using Knowledge of Structures and Functions; Choosing and Evaluating a Range of Subjects, Symbols and Ideas

Materials Required:

- Board and markers
- Laptop, monitor, digital projector
- Demo items/teacher addendum items as listed within the lesson plan

Resources:

- General Information: http://www.nationalmuseum.af.mil/factsheets/factsheet_print.asp?fsID=19109&page=1 and http://www.nationalmuseum.af.mil/factsheets/factsheet_print.asp?fsID=19106&page=1 and http://www.nationalmuseum.af.mil/factsheets/factsheet_print.asp?fsID=19108&page=1 and http://science.hq.nasa.gov/kids/imagers/amelia/ and http://en.wikipedia.org/wiki/Remote_sensing
- *Remote Sensing of the Environment: An Earth Resource Perspective* by J. R. Jensen; Upper Saddle River, NJ: Prentice Hall, 2000
- *Universe: Stunning Satellite Imagery from Outer Space* by Heather Cooper; San Diego, CA: Thunder Bay Press, 2006

Procedures for Lesson Plan –Part 2 (continued)

- Show the class a kite (any type of kite will do) and tell them that this was another way people got cameras up into the sky to take photos from above, and this method was started over a century ago! Show them the fourth slide which shows the way some cameras have been suspended from kites—and the fifth slide is a photograph of the San Francisco earthquake of 1906 taken by a 'kite camera.' This one is tough to decipher (unclear).
- Ask the students if they can think of other ways aerial photos could have been taken long ago. Call on students and make sure someone remembers the exercise they did in Lesson Plan A, when the class pretended they were up in a hot air balloon (show slide six)! Show slide seven and tell them that this 'photo rocket' had a camera mounted inside the upper (payload) section of a very large model rocket. Slide eight is an actual photograph of a Swedish landscape taken from a solid fuel rocket at the turn of the last century (1900 that is)!
- Give the class a bit of practice using 'clues' to try to determine what these 'side view' and 'bird's eye view' photos represent: the first one (slide nine) shows the normal view of the Pentagon in Arlington, VA. The class probably won't be able to tell what this famous building is from the side. However, looking at it from the 'bird's eye view' perspective (slide ten) students should be able to notice things such as the shape of the building, the dark trees in the middle of the complex, the many cars in the parking lots and all of the expressways leading to and from the building (including a large 'cloverleaf' formed as part of one of the highway system). Slide eleven shows a 'bird's eye view' of another famous building in Washington, DC—ask students to give you clues that they see (including shading, shadows, shapes and texture). Yes, it is the Washington Monument (show them slide twelve). Slide thirteen is filled with geometric shapes, textures, colors and shadows—ask if anyone knows the name of the island (Liberty Island) and what famous monument is on it (the Statue of Liberty)! A person's perspective/side view of the famous statue is revealed in slide fourteen! Regarding slide fifteen—have students raise their hands when they wish to share one thing/one clue they can see. Examples may include: the trees have lost their leaves, the fans look like colorful marbles, there are football players, cheerleaders, a scoreboard, the football field forms a huge rectangle and the stadium forms a large oval—it is the University of Montana's crowded football stadium! Slide sixteen shows two fighter jets flying over a city—ask students what clues they see that will help them determine what capital city is shown (such as pyramids, sand, etc.). Some students will know that it is Cairo, Egypt!
- Tell the class that it is now time to discuss more current remote sensing methods! Show the students slides seventeen (the Global Hawk) and eighteen (the Predator) and explain that these aircraft fly without a pilot! They are called Unmanned Aerial Vehicles (UAVs) or Remotely Piloted Vehicles (RPVs) and they take very clear aerial photographs for us (they are 'piloted' by personnel who are far, far away from the aircraft). Show the class slides nineteen and twenty (the U-2 'spy plane' and the SR-71 'Blackbird,' respectively) and tell them that these airplanes DID require pilots—they flew high above the Earth and took a lot of aerial reconnaissance photos for our government. The "Blackbird" was also used by the National Aeronautics and Space Administration (NASA) as a test aircraft/platform for various experiments!
- Have the students try drawing the SR-71 from above. Tell them that, even though the 'Blackbird' can fly over sixteen miles high, they may pretend that they are flying even higher, so that they are looking straight down at the aircraft! Give the class ample time, and only assist students who are having difficulty perceiving what the airplane might look like. When students are finished, show slides twenty one and twenty two (above SR-71)!

TEACHER ADDENDUM
PAGE 3

Some of the ideas contained within these lesson plans were derived from information obtained from an animated NASA lesson plan entitled "The Adventures of Amelia the Pigeon."